

**3.7 Design Reliability Assurance Program**

The Design Reliability Assurance Program (D-RAP) is a program that will be performed during the detailed design and equipment specification phase prior to initial fuel load. The D-RAP evaluates and sets priorities for the structures, systems, and components (SSCs) in the design, based on their degree of risk significance. The risk-significant components are listed in Table 3.7-1.

The objective of the D-RAP program is to provide reasonable assurance that risk-significant SSCs (Table 3.7-1) are designed such that: (1) assumptions from the risk analysis are utilized, (2) SSCs (Table 3.7-1) when challenged, function in accordance with the assumed reliability, (3) SSCs (Table 3.7-1) whose failure results in a reactor trip, function in accordance with the assumed reliability, and (4) maintenance actions to achieve the assumed reliability are identified.

1. The D-RAP provides reasonable assurance that the design of risk-significant SSCs is consistent with their risk analysis assumptions.

**Inspections, Tests, Analyses, and Acceptance Criteria**

Table 3.7-3 specifies the inspections, tests, analyses, and associated acceptance criteria for the D-RAP.

<b>Table 3.7-1 Risk-Significant Components</b>	
<b>Equipment Name</b>	<b>Tag No.</b>
Component Cooling Water System (CCS)	
Component Cooling Water Pumps	CCS-MP-01A/B
Containment System (CNS)	
Containment Vessel	CNS-MV-01
Hydrogen Igniters	VLS-EH-1 through -64
Chemical and Volume Control System (CVS)	
Makeup Pumps	CVS-MP-01A/B
Makeup Pump Suction and Discharge Check Valves	CVS-PL-V113 CVS-PL-V160A/B
Diverse Actuation System (DAS)	
DAS Processor Cabinets and Control Panel (used to provide automatic and manual actuation)	DAS-JD-001 DAS-JD-002 DAS-JD-004 OCS-JC-020
Annex Building UPS Distribution Panels (provide power to DAS)	EDS1-EA-1, EDS1-EA-14, EDS2-EA-1, EDS2-EA-14

<b>Table 3.7-1 (cont.) Risk-Significant Components</b>	
<b>Equipment Name</b>	<b>Tag No.</b>
Rod Drive MG Sets (Field Breakers)	PLS-MG-01A/B
Containment Isolation Valves Controlled by DAS	Refer to Table 2.2.1-1
<b>Main ac Power System (ECS)</b>	
Reactor Coolant Pump Switchgear	ECS-ES-31, -32, -41, -42, -51, -52, -61, -62
Ancillary Diesel Generators	ECS-MS-01, -02
6900 Vac Buses	ECS-ES-1, -2
<b>Main and Startup Feedwater System (FWS)</b>	
Startup Feedwater Pumps	FWS-MP-03A/B
<b>General I&amp;C</b>	
IRWST Level Sensors	PXS-045, -046, -047, -048
RCS Hot Leg Level Sensors	RCS-160A/B
Pressurizer Pressure Sensors	RCS-191A/B/C/D
Pressurizer Level Sensors	RCS-195A/B/C/D
Steam Generator Narrow-Range Level Sensors	SGS-001, -002, -003, -004, -005, -006, -007, -008
Steam Generator Wide-Range Level Sensors	SGS-011, -012, -013, -014, -015, -016, -017, -018
Main Steam Line Pressure Sensors	SGS-030, -031, -032, -033, -034, -035, -036, -037
Main Feedwater Wide-Range Flow Sensors	SGS-050A/C/E, -051A/C/E
Startup Feedwater Flow Sensors	SGS-055A/B, -056A/B
CMT Level Sensors	PXS-011A/B/C/D, -012A/B/C/D, -013A/B/C/D, -014A/B/C/D
<b>Class 1E dc Power and Uninterruptible Power System (IDS)</b>	
125 Vdc 24-Hour Batteries	IDSA-DB-1A/B, IDSB-DB-1A/B, IDSC-DB-1A/B, IDSD-DB-1A/B
125 Vdc 24-Hour Battery Chargers	IDSA-DC-1, IDSB-DC-1, IDSC-DC-1, IDSD-DC-1

<b>Table 3.7-1 (cont.) Risk-Significant Components</b>	
<b>Equipment Name</b>	<b>Tag No.</b>
125 Vdc and 120 Vac Distribution Panels	IDSA-DD-1, IDSA-EA-1/-2, IDSB-DD-1, IDSB-EA-1/-2/-3, IDSC-DD-1, IDSC-EA-1/-2/-3, IDSD-DD-1, IDSD-EA-1/-2
Fused Transfer Switch Boxes	IDSA-DF-1, IDSB-DF-1/-2, IDSC-DF-1/-2, IDSD-DF-1
125 Vdc Motor Control Centers	IDSA-DK-1, IDSB-DK-1, IDSC-DK-1, IDSD-DK-1
125 Vdc 24-Hour Inverters	IDSA-DU-1, IDSB-DU-1, IDSC-DU-1, IDSD-DU-1
<b>Passive Containment Cooling System (PCS)</b>	
Recirculation Pumps	PCS-MP-01A/B
PCCWST Drain Isolation Valves	PCS-PL-V001A/B/C
<b>Plant Control System (PLS)</b>	
PLS Actuation Software and Hardware (used to provide control functions)	Refer to Table 3.7-2
<b>Protection and Monitoring System (PMS)</b>	
PMS Actuation Software (used to provide automatic control functions)	Refer to Tables 2.5.2-2 and 2.5.2-3
PMS Actuation Hardware (used to provide automatic control functions)	Refer to Tables 2.5.2-2 and 2.5.2-3
MCR 1E Displays and System Level Controls	OCS-JC-010, -011
Reactor Trip Switchgear	PMS-JD-RTS A01/02, B01/02, C01/02, D01/02
<b>Passive Core Cooling System (PXS)</b>	
IRWST Vents	PXS-MT-03
IRWST Screens	PXS-MY-Y01A/B
Containment Recirculation Screens	PXS-MY-Y02A/B
CMT Discharge Isolation Valves	PXS-PL-V014A/B, -V015A/B
CMT Discharge Check Valves	PXS-PL-V016A/B, -V017A/B
Accumulator Discharge Check Valves	PXS-PL-V028A/B, -V029A/B
PRHR HX Control Valves	PXS-PL-V108A/B

<b>Table 3.7-1 (cont.) Risk-Significant Components</b>	
<b>Equipment Name</b>	<b>Tag No.</b>
Containment Recirculation Squib Valves	PXS-PL-V118A/B, -V120A/B
IRWST Injection Check Valves	PXS-PL-V122A/B, -V124A/B
IRWST Injection Squib Valves	PXS-PL-V123A/B, -V125A/B
IRWST Gutter Bypass Isolation Valves	PXS-PL-V130A/B
<b>Reactor Coolant System (RCS)</b>	
ADS Stage 1/2/3 Valves (MOVs)	RCS-PL-V001A/B, -V011A/B RCS-PL-V002A/B, -V012A/B RCS-PL-V003A/B, -V013A/B
ADS Stage 4 Valves (Squibs)	RCS-PL-V004A/B/C/D
Pressurizer Safety Valves	RCS-PL-V005A/B
Reactor Vessel Insulation Water Inlet and Steam Vent Devices	RCS-MN-01
Reactor Cavity Doorway Damper	-
Fuel Assemblies	157 assemblies with tag numbers beginning with RXS-FA
<b>Normal Residual Heat Removal System (RNS)</b>	
Residual Heat Removal Pumps	RNS-MP-01A/B
RNS Motor-Operated Valves	RNS-PL-V011, -V022, -V055, -V062
RNS Stop Check Valves	RNS-PL-V007A/B, -V015A/B
RNS Check Valves	RNS-PL-V013, -V056
<b>Spent Fuel Cooling System (SFS)</b>	
Spent Fuel Cooling Pumps	SFS-MP-01A/B
<b>Steam Generator System (SGS)</b>	
Main Steam Safety Valves	SGS-PL-V030A/B, -V031A/B, -V032A/B, -V033A/B, -V034A/B, -V035A/B
Main Steam Line Isolation Valves	SGS-PL-V040A/B
Main Feedwater Isolation Valves	SGS-PL-V057A/B
<b>Service Water System (SWS)</b>	
Service Water Cooling Tower Fans	MA-01A/B

<b>Table 3.7-1 (cont.) Risk-Significant Components</b>	
<b>Equipment Name</b>	<b>Tag No.</b>
Service Water Pumps	SWS-MP-01A/B
Nuclear Island Nonradioactive Ventilation System (VBS)	
MCR Ancillary Fans	VBS-MA-10A/B
I&C Room B/C Ancillary Fans	VBS-MA-11, -12
Chilled Water System (VWS)	
Air Cooled Chiller Pumps	VWS-MP-02, -03
Air Cooled Chillers	VWS-MS-02, -03
Onsite Standby Power System (ZOS)	
Engine Room Exhaust Fans	VZS-MY-V01A/B, -V02A/B
Onsite Diesel Generators	ZOS-MS-05A/B

Note: Dash (-) indicates not applicable.

**Table 3.7-2  
PLS D-RAP Control Functions**

CVS Reactor Makeup  
RNS Reactor Injection from cask loading pit  
Startup Feedwater from CST  
Spent Fuel Cooling  
Component Cooling of RNS and SFS Heat Exchangers  
Service Water Cooling of CCS Heat Exchangers  
Onsite Diesel Generators  
Hydrogen Igniters

<b>Table 3.7-3 Inspections, Tests, Analyses and Acceptance Criteria</b>		
<b>Design Commitment</b>	<b>Inspections, Tests, Analyses</b>	<b>Acceptance Criteria</b>
1. The D-RAP provides reasonable assurance that the design of risk-significant SSCs is consistent with their risk analysis assumptions.	Inspection will be performed for the existence of a report which establishes the estimated reliability of as-built risk-significant SSCs.	A report exists and concludes that the estimated reliability of each as-built component identified in Table 3.7-1 is at least equal to the assumed reliability and that industry experience including operations, maintenance, and monitoring activities were assessed in estimating the reliability of these SSCs.